





*To J Marshall &
from the author*

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ON THE

PREVENTION OF EPIDEMICS

BY

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ON THE PREVENTION OF EPIDEMICS.

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EDWIN CHADWICK, C.B.

I HAVE been requested to give a Paper on the health of towns and on the sanitary legislation affecting them. In relation thereto I begin with an account of one special measure of such legislation, involving the sanitary principles of relief and protection against ordinary epidemics, such as the small-pox; and I believe I may best do this by a narrative of the measures for a defensive campaign undertaken to withstand the invasion of the extraordinary epidemic of Asiatic cholera in 1848-49, which may probably be new to most people at this time. At the first general Board of Health of which I was the chief executive officer we had, in 1848, warning of the approach from India of the enemy, and the threat by such infliction of a heavier slaughter by thousands than would be effected by visible enemies of the largest of hostile foreign hosts. Our first council was as to the nature and state of the former established defences. Those of the old routine were for the outer defences by strict quarantines, and, when these defences were broken through, of hospitals, and a common treatment of the sick in them—almost of necessity in the later collapsed stages of the disease. We had information of the measurable distances of infection from the specific disease not greater than those of our common epidemics; but, as we showed in a report on quarantines, which was accepted and translated for circulation, the quarantine service as practised on the Continent as a defence, would be as an attempt at shutting out the east wind, and, for reasons which I shall give, utterly illusory as a defence against cholera. Our conclusions on that head have been affirmed by subsequent experience, especially by the vastly quickened international communica-

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tions, by steam on sea as well as on land, which bring in and distribute everywhere persons in conditions of 'latent incubation' of infectious disease, diffusing everywhere, according to our information, had this view been correct, sources of infection that must have aggravated such visitations to an extent never heretofore experienced. I have shown that all the mischievous and false securities of quarantines against epidemics, and grievous obstructions to international communication will have to be removed. It appeared to me and my colleagues, on examination, that the great impending visitation would probably advance as to places chiefly on the lines, and on local conditions, on which ordinary epidemics now proceed. In Poor Law administration, I had been pressed by medical officers to take business out of its turn, because, from the state of the weather, they had a confident expectation that they would have some visitation of one of the ordinary epidemics to deal with. Asking one of them, the medical officer, what was the specific disease he apprehended, he stated that when he arose in the morning and found the atmosphere warm, moist, and stagnant, he always found that there would be an increase of some foul air disease;—it might be typhoid, it might be scarlatina, it might be measles, it might be small-pox, but one species or another of eruptive disease he was sure to have in such weather in the low-lying and ill-drained districts. I asked a relieving officer of a large district—to test his knowledge of the habitat of such disease—whether, if I gave him some half-dozen cabs, he knew where, without previous knowledge, he could go and fill them with fever cases, and he said he could, just as a gamekeeper might go and get a bag of game—he said he certainly could; the cases might not be all of typhus, but fever cases of one sort or another, he knew where he could find them. It appeared that small-pox follows on much the same lines as typhus, and so does scarlatina, but with wider deviations as to classes of cases and conditions of persons. On passing through a low district I observed, 'Surely this must be a fever nest,' when out came some children with the marks of recent small-pox upon them. I remember that I was once consulted by Dr. Lyon Playfair as to the readiest mode of making a sanitary inspection of an urban district, without the medical officer's or the Registrar-General's returns, which there was no time to get out. I advised him to go into one of the primary schools, and select a group of the most squalid children, get their addresses, and go there. He told me that he had acted on this suggestion; and that, in the first school, there were two boys with

particularly blotched faces, and he had found that their habitations were at the confluence of some putrid sewage. On ill-paved, ill-cleansed, and filthy streets, the attacks are heavy, especially amongst children. On well-paved and well-cleansed streets the attacks are light, and it was observed that epidemics pass over those clean lines, and pass over the other. The fact is that they occur in the other. I have indeed myself, on view of the children of different large district schools, made proximate estimates of the comparative death-rates of the districts whence they came; and it is a large and most pregnant fact, attested by experienced teachers, that as the lowest districts have been improved by sanitation, the type of the children received therefrom has been improved. In the rural district, a medical officer pointed out a white sheet of mist spread over a valley, and said that that mist covered the bulk of his patients: that out of it he had hardly any cases but midwifery cases and accidents. This gave a lesson on land drainage, which reducing or removing the mists reduced or removed epidemic attacks. On inquiring as to the course of the Asiatic cholera in its previous visitation in the urban districts for which we had then only time to enquire, we found that it was very much upon the common fever conditions. It did not visit them all, but such as it did were visited with marked severity. Indeed, medical officers of experience in the former visitation foretold in which streets, and on what sides of street, and what houses it would again come; and their forecast was verified even as to the rooms of particular houses. The variations of the types of these extraordinary visitations, and their repeated attacks on populations in the like local conditions, and the state of the intelligence which continues those conditions, is a matter of profound interest in sanitation. In the City of York we had one classical instance presented of a particular court, called the Hagworm's Nest (the Hagworm is a species of anguis, infesting foul heaps), which by tradition was the first spot visited by 'black death;' the first by the 'great plague;' the first by the 'sweating sickness;' and as it remained unchanged, inquiry was made whether it was true to its traditions on the visitation of the cholera in 1832, and it was so. We have had analogies to such variation of the types of epidemic visitations on the like local conditions, in more recent times. For example, Dr. John Sutherland, our active sanitary inspector in London, and on the Army Sanitary Commission in the Crimea, and Captain Douglas Galton, in their conjoint and separate reports, as members of the Barrack and Hospital Improvement Commission

Varied
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on Malta, show that the same localities and houses in Malta which yielded the majority of plague deaths there in 1813, yielded the majority of the deaths in the cholera epidemics of 1839 and 1867; and that in the intervals the same localities yielded the majority of cases of small-pox, fever, and of an anthrax, a very special eruptive epidemic attended by carbuncles. In his report on cholera in Gibraltar, Dr. Sutherland, as to attacked houses existed there during the epidemics of 1850 and 1865. Up to our time, although the occurrence of the epidemics on certain local conditions was noted, the occurrence was taken as a constant, and no steps were thought of or taken to change those conditions. The results of the experience had then pointed out to us that the first objective points of defence against the coming attack lay in the alteration as far as might be done within the time of the conditions of the exposed places, the sites of the ordinary foul-air diseases on their epidemic visitations. We sent out instructional notifications to the Boards of Guardians, and the Local Authorities, to put them on the alert against the extraordinary visitation coming. They were inapt and dilatory. We then sent out our sanitary inspectors to examine and report on the particular measures to be taken for the protection of the population in the most exposed districts in the Metropolis. It is to be observed, that action by such authorities at intervals of board meetings are slow, and that, for prevention, it must be quick, and by skilled and responsible officers. Much was done in the lower districts there and elsewhere by extra activity in surface cleansing. Parish fire-engines were turned out, and courts and alleys were thoroughly washed down by them. For covering the excrement-sodden pavements and surfaces in the close courts, such as urban districts particularly of the Northern towns paved with bolder stones, we ordered fresh mould to be brought in, and a covering made over them and over dungheaps, some three inches deep, to serve as an earthwork as it were. The people declared where this was done that they felt themselves in new atmospheres such as they never had before. We ordered pigs to be turned out and the sties to be cleansed. In some of the Scotch towns there was great uproar against this, but our orders were then law, and the pigs were turned out by the thousand and kept out until the epidemic had passed. Stagnant ditches were ordered to be drained. But we soon found that, simple as it might appear, the work of ditch cleansing could not be left with safety to the parish authorities, but must be done under skilled superintendence, as to methods and times, or that otherwise the

Alterations
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people were apt to spread the putrid contents over the banks and extend the evaporating surface so as to generate immediate fever. Stable dung we ordered to be removed, and the stables in mews to be cleansed daily, and one experience I gained was, that by proper arrangements this might be done in ordinary times with little extra expense. But there were places which we found to be in conditions of filth that were irretrievably bad. There our only remedy appeared to be, as the epidemic advanced, to tent out the people. We borrowed tents from the army stores in the Tower, and ordered the people to be tented out in them, as at Wolverhampton and other places. One of them, the small fishing town of Mevagissey in Cornwall, presented when the cholera came an instructive instance of the local climatic character of the epidemic. People in the tents after some days got tired of bivouacing out and returned to their dwellings, where they were re-attacked with premonitory symptoms; they returned to their tents and were freed from them. They again ventured back to their homes, and were again attacked. They returned to the tents, and were freed and remained there until the epidemic had passed. I was informed that members of the bar of the Northern Circuit, on going to towns where the cholera was advancing, were many of them subject to premonitory attacks, on leaving one town were freed until they got into another affected town, where they were again attacked, and on leaving it were again freed.

Evidence of the local climatic character of the extraordinary epidemic visitation.

During the prevalence of the epidemic, Lord Palmerston sent for me, and told me that the Queen had been invited to return from Scotland in the direction of one of the towns, and asked whether I thought it safe for Her Majesty to do so. I advised certainly not, and I did so from the belief that the epidemic was climatorial, and the information of the fact that passengers staying only for a night in the good hotels of one of the districts had been subject to premonitory attacks.

Instances were noted in India, Russia, and Germany, as characteristic of the epidemics, that birds such as rooks disappeared on its advance, and only returned on its departure. Thus Colonel W. K. Stuart, of the 86th Regiment, in his Memoirs, states in relation to the cholera at Burantpore:—‘ Before proceeding further I must relate a curious circumstance that occurred, which, in my opinion, establishes beyond doubt the fact that the cholera is atmospheric. Every person who has served in India must be aware of the number of kites, vultures, and other birds of prey that congregate around the cantonments of a regiment. For some days before the first case of cholera broke out, all these birds had disappeared; not one

was to be seen, and they never returned until the plague was gone. Where they went to nobody knew, but such was the case. Surely they must have been made conscious by the sense of smell, or by some instinct, that there was danger in remaining in that atmosphere.' It has been held that the cholera is conveyed only by human intercourse; and when it advances itself, in the direction of lines of communication, it may appear to be carried in that way. If there had been any affected persons in the houses at Mevagissey, it might have been surmised that the people returning were infected by the persons instead of by the places, and in the places being many of them excrement-sodden the attacks might be ascribed to the alvine secretions which were probably exciting causes. But troops on the march in India have been attacked on particular open spots, clear of population, and on a change of position, as from one hillside to another, have been freed from attack.

We had neither time nor means to direct the efforts of chemists, to ascertain, if they could, what these aërial conditions were. But be those conditions what they might, they appeared to traverse districts in particular directions. In India there appears to be a cholera law on the subject. Thus cholera is moving along a certain line to the north-west. In the rural districts the people are sedentary, and they scarcely ever move from home. But onward moves the epidemic. At last it arrives on the borders of the desert, where there are no people, and no intercourse, no alvine secretions, and no sewers, yet the statistician sitting in Calcutta can tell almost the day in which the epidemic influence will have crossed the desert. On such facts there appears to be as little ground for speaking of the importation of the infection of cholera by persons, as there would be of the importation of the 'infections of skin eruptions,' which we know are attendant on the advent of the east winds.

I may here state, that although the evidence points to the fact of these large epidemics occurring at long intervals being chiefly climatorial, or affecting particular areas, they may yet be, and, as in the case of the small-pox, they largely are communicable by infection. Permit me to illustrate this by a story told of Beau Brummel: a friend met him with his throat muffled up, and asked what was the matter with him, when Brummel answered that it was owing to that rascal Tom his servant having put him in the same room with a damp stranger! Now a damp stranger might have done this to a highly sensitive person. But a crowd of damp strangers in a room might be really additionally dangerous, although the

Epidemics
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climatic.

cause was climatorial, and due to the outside storm which made them damp. When an ordinary epidemic advances, is it ever observed, that there has been no extraordinary corresponding movement of persons, or of society preceding it? And recent information in India with cholera-stricken regiments returning from Afghanistan to India has shown that even if cholera be infectious, it cannot be carried backwards along the line of advance. We directed an examination of the cholera advance in the metropolis, and found it did not advance in succession, case after case, but nearly simultaneously in widely scattered instances between which it was impossible to prove communication. By the various means I have recited, we got the local defences more extensively prepared than might have been expected, considering the very inadequate central staff we had at our disposal, and the weak local staff. We were greatly aided by reasoned notifications on which we derived great aid—from the clergy, and persons of education.

But we could not cover all points of defence effectively. There were obviously weak lines through which we must expect that the coming epidemic would break, and we must provide for a greater or less number of sick and wounded. For them the provision of hospital accommodation was heretofore usual and general, and the exclusive system. On this topic we made anxious inquiry. We sent for all the practitioners we could get together, who had been in the thick of previous visitations, and consulted their experiences as to what did do and what did not do in cholera.

From them we gathered this experience; that, in the stages of collapse of the disease, the mere act of lifting up the patients from their beds to remove them frequently killed them; also that conveyance over rough roads in common cabs, or even in litters, delivered many dead at the hospital. In the hospitals, moreover, the mortality, under every form of treatment, was excessive. On the whole, with all defects of their homes, and the difficulties of medical appliances in them, it were better to let them remain there than to remove them. The evidence in support of this conclusion was so strong that we were led as a general rule to dispense with the provision of special, or even general, hospitals. We had then to resort to provisions for home treatment. At this time we made, what was really, as regarded all antecedent treatment, a discovery. Through my friend Mr. Hodgson, of the College of Surgeons, we learned that a Dr. McCann, of Bilston, had made much observation of the previous course of the disease, and had ascertained that it had generally premonitory symptoms of

Why large hospitals' treatment abandoned.

Discovery of premonitory symptoms of the extraordinary epidemics.

slight diarrhœa, with rice water purgings, and that in that stage, if taken in time, it was amenable to regimen and medical treatment. But the same observation had been made by other medical men in other parts of the kingdom. This general fact was established upon the widest information we could collect. We, upon this, consulted the curative authorities, the College of Physicians, and obtained from them the sanction of medical treatment by opiate confection. With this we inaugurated a general system of house to house visitation, to inquire as to each person in the family, whether he had experienced any premonitory symptoms, or observed rice water evacuations, and, if so, to give the medicines provided in packages; and to accompany such exhibition with instructions as to precautions in the regimen due to a weakened stomach. There was at first great difficulty in finding properly qualified house-to-house visitors, and getting them into action. Then it was that we had experience of the evils of the default of the local administrative organisation, against which I had from the first remonstrated, and which has yet to be removed for the effectual reduction of the ordinary epidemics—the evil, *e.g.*, of allowing the public health service to be combined with private practice. For at this time, when there was the greatest pressure for the public service, there was the conflict of the preponderant private interest in the greatest pressure upon the officer for his service to his private patients. We got the local deficiencies from this cause supplied as well as we could in the time, though it was with great inconvenience and often with loss. On the whole the house-to-house visitation and home treatment was eminently successful in meeting the extraordinary epidemic, and it commends itself for adoption decidedly in dealing with ordinary epidemics. By it in this epidemic errors in regimen were most easily overcome. An effect of the visitation reported as observable in various districts, the causes of which passed without examination, was to depress vitality as if the people were made old and weakly by it, and to make irregularities and all errors in diet, which in ordinary times had been heretofore incurred with impunity, at this time particularly injurious. It appeared as if some of the common sources of water supply had been injuriously affected by a passing cause: so much did this appear to be the case in some of the rural districts as to create a suspicion in the minds of the people that their wells had been poisoned. The common course of the attack of the epidemic on a place undefended by any organisation was that it began with a large proportion of deaths to the attacks; one half, even, fell,

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epidemic.

then one out of three; as it spread widely the proportion of deaths diminished to one out of four, of five, and of six, and so it went on until the epidemic was exhausted. Its rise was represented by a curve, like a mountain; the curve then gradually fell in number and in the proportion of attacks, until the epidemic disappeared. At the first onset of the epidemic, no treatment appeared to succeed: as the epidemic spread, and the force of the attack weakened, and became reduced, then almost every sort of medical treatment appeared to succeed, or had the credit of succeeding. By the defensive course taken, of diminishing the local aerial impurity by cleansing the places, the number of the attacks was reduced:—by the house-to-house visitation, and the dietetic and medical treatment, the proportions of deaths to attacks were immediately and decidedly reduced. So clearly was this the case, that if from the daily returns to one central office from any place it appeared that the proportion of deaths to attacks was not reduced,—if the proportion of attacks still went on,—we were clearly of opinion that there must be some default, and that the house-to-house visitation must have been interrupted, or not carried out. In one large place the house-to-house visitation had been arranged and brought into operation, with the proper results. Suddenly the proportion of deaths to the attacks, and the number of attacks, rose again. It was evident to me, at the Central Board, that the house-to-house visitation was interrupted. One of our most efficient assistant-commissioners was telegraphed for and sent to the spot, where it was found, as apprehended, that from some dispute amongst the local authorities, the house-to-house visitation had been stopped. Matters were arranged, the practice was restored, and carried on properly, when the proportions of attacks and of the deaths to attacks were again reduced, until they entirely ceased. On a view of the results of this same great epidemic visitation of the cholera in continental countries, where it was met in the old way chiefly by reliance for defence on quarantines, and then, when it got in, on impromptu hospital accommodation, with general treatment necessarily chiefly in the collapsed stages, and a comparison with the results of the treatment we adopted of the removal, as much as possible, of the predisposing local causes, as by cleansing the places, and then of a house-to-house visitation and home treatment in the earliest stages, in the place of a general hospital treatment—it was evident that we obtained a gain of full two-thirds by our defensive course. Comparing the rate of mortality with that which prevailed in Sweden, where the ordinary death-rate was then lower than in Great

General results of the course of dealing with the epidemic, by altering the local conditions and by home treatment.

Britain, but where our precautions and the home treatment were not taken, it appeared that we might claim to have saved some fifty thousand lives. But Professor Zedkauer, Consulting Physician to the Emperor of Russia, supplies decisive testimony of demonstrative facts on the point in a letter written to the last Medical Congress at Brussels. In that letter he says that 'to England is due the honour of having introduced on a large scale measures (prophylactiques) against the contagion of cholera.' He states that during the cholera epidemics of 1830, 1848, and 1855, there were not less than from 23,000 to 25,000 deaths, or from 47,000 to 50,000 attacked with cholera in St. Petersburg, but that in 1866, when they became acquainted with our practice in the house to house visitation and followed it, out of 15,000 attacks they had only 3,000 deaths. On an independent examination of the work for the attainment of the end described, I think it would be evident that if there had been any other than the ordinary distracted political attention prevailing at the Government; had there been a Minister of Health, such as it is now agreed that a State organisation requires, with a superior responsibility and interest in observing the beneficial working of the temporary administrative power confided to us—if it had been duly observed how large an amount of sickness and death was saved by the exercise of that power during so short a time, it may be submitted that there would have been an anxiety to make the authority permanent, to strengthen it, by due public acknowledgment of the service rendered, and to extend it. But when the extraordinary epidemic disappeared, the special organisation—the powers of prevention were allowed to lapse. Some time after, the first Board which had achieved the result was discontinued; and its discontinuance was received abroad as a shock and injustice, and was publicly expressed as such by the chief sanitary authority of France. The uninstructed, unaided, and lax local administration reappeared, and with it the causes of the foul air diseases, and also the ordinary epidemic diseases which now cost some hundred thousand of the preventible deaths throughout the kingdom, the extent of such accommodation for which provision is now in question. The visitation of the cholera in 1848-9 which the first general Board of Health dealt with, reappeared in 1854, and had to be dealt with by the department, under the presidency of a political chief. Most beneficial examples had been achieved by the almost entire clearance of the common lodging-houses from the ordinary epidemics, by the application of the principles developed by the first General Board under Lord Shaftesbury's Act, and by the

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model lodging-houses, chiefly by house drainage, ventilation, and the prevention of overcrowding, initiated by the Prince Consort, where the death-rates of the class-occupants have been reduced nearly one-half. But these examples cited in the general report, made for the new president by Dr. John Sutherland, our chief sanitary inspector, had yielded little mitigation. It was found, on renewed local examination by the officers of the Board in the metropolis, that the local conditions of filth, and of the ordinary epidemic diseases had reappeared, together with those ordinary epidemics. I may mention, as respects London, that our Board had elaborated a plan for placing the water supply of the Metropolis under unity of management on a public footing, such as we had effected in a number of provincial towns, involving the adoption of the constant supplies, and the abolition of stagnation in cisterns which make good supplies bad and bad supplies worse. In the report made by a new inspector, Dr. Hassall, on the second reappearance of the Asiatic cholera, he is struck with the continuance of this evil condition, and he says, 'I beg to express my conviction that the water supply of the Metropolis will never be in a satisfactory condition until the use of cisterns is abandoned, and the constant method of supply adopted.' But through the greater part of the Metropolis this vicious system is continued up to this time (1881), together with the waste of more than three-fifths of the water pumped in, which being fouled water, saturates the excrement-sodden sites with a quantity of fouled water equal to a double rainfall, the results of which are shown in the supersaturated lower levels by double attacks of the ordinary epidemics. But this continuance of the old evils as respects the water supply is accompanied by augmented charges, sanctioned by Parliament, for double and threefold separate works, for the separate trading companies that would have been unnecessary under the unity projected on a public footing, which unity has since continued to be reinforced, as a necessity, by commission after commission. Plans had been got out based on trial works, and experiences obtained of buildings for carrying out all the fouled water by self-cleansing house drains, and this would have been accomplished as was proved by experiences in block buildings within the expenses incurred for amending and maintaining the old drains of deposit, or at about a third of the expense that must now be incurred by the individual householder who drains his house separately, even under one of the effective Sanitary Defence Associations that are now being usefully promoted, and which would not have been necessary under a

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combined central supervision acquainted with sound principles of sanitary works. For the reception of the fouled water were provided chiefly tubular sewers, which by their ordinary dry weather flow were proved to be self-cleansing and to need no flushing. For the lower districts a concentrated flow and a quick discharge by engine power from sumps was prepared. For the relief of the low-lying marsh districts, which are a great source of the fogs of the Metropolis, a separate system was in preparation on the principle of the successful drainage of the fen districts of Lincolnshire. From the results of the rudimentary applications of the sanitary principles executed in some twenty towns, as at Croydon, where the whole of the fouled water is out of the houses and out of the town on the land in some two hours, there can be no doubt that all the matter of putrefaction which now remains in ill-drained houses and the sewers of deposit for months and years would have been removed from the Metropolis to the fields of the application at considerable distances within half a day, with the result obtained in those several instances quoted, of a reduction of the general sickness and death-rate by at least one-third. But to effect this, entire unity over the whole Metropolis was essential for the combination to be effected by very special science. It would be too long, and beside the present purpose to state how the sanitary authority which had prepared this was set aside by a surprise-vote against the Government, by combined adverse interests at a morning sitting, and how the succeeding political President of the Board brought in a 'Bill' for the government of metropolitan works, by which all the requisite unity was destroyed; with the entire omission of the essential part of the system—the house drainage; and a bill was passed to effect the disunity by placing the trunk lines of the sewers under one authority and the branch lines under thirty-six others, and those others, of all authorities for dealing with a scientific work, the vestries! Under such rule the old conditions of the ordinary epidemics are maintained. On a recent examination of some mile of trunk sewer which was a foot deep with putrid deposit, a line giving off fever into the public offices was discovered which, combined with bad house drainage and the foul sewage of the rest of the district, recently occasioned the loss of Dean Stanley. It is not unfair to observe that the President who, left to our officers and the partial use of our measures, without the increased experience that would have been available for the task of meeting the second extraordinary visitation of the cholera, in 1854, and who brought in the measure which I have described as effecting the egregious subsisting disunity of works, which, if the con-

Disunity of works maintained where unity necessary for efficiency and economy in the Metropolis.

dition of the Metropolis is to be ever retrieved, must certainly be set aside, claimed, and was accorded a peerage for that work,—the mischief of which neither he nor the Government could have understood in the retention of lines, really of epidemic, neither he nor the Government could have known, and that all will have to be superseded by the system of unity and circulation for the more expensive as well as more mischievous one, now prevalent, of disunity and stagnation. By the change brought about at the Central Department, officers who had done the most meritorious preventive work, calling for acknowledgment, were put under a cloud, as it were, as if they had been doing something bad, only excusable by defaults of their instructions. In the Metropolis the works were given over chiefly to railway engineers, who had nowhere done sanitary work or reduced a death-rate by a percentage. Their first objective point for sanitation was the purification of the river by intercepting sewers, made great to receive, with the sewage, extraordinary storm water. Those works are pronounced to be great blunders, accumulating deposit, and acting as extended cesspools, giving off, like the one I have described, noxious products of decomposition. The expense of these trunk lines of intercepting sewers would, it is now shown, have sufficed for the re-drainage of every street, court, and alley in the metropolis, with self-cleansing sewers, and also to have re-drained the worst of the ill-drained houses. As to the river, Professor Frankland repeatedly reports its continued impurity. By microscopical examination he finds epithelia in it, human fibrine, and in a note to me he describes its condition to be one in which the people are made, as it were, refined anthropophagi, consumers of what has formed portions of humanity. Whilst these works were in full operation up to the last decade, there was a general increase of the death-rate. Since then, there have been large reductions of overcrowding in particular districts. The City of London proper has been reduced in population to about half that of Brighton. Hence there has been a check and some reduction of the death-rates; but they are now in excess by one-third. The great lines of the ordinary epidemics have, however, been left, and every measure which sanitary science had prepared will inevitably have to be restored, to bring up the Metropolis to the sanitary conditions of the places where they have been properly applied, was left untouched. Our subject is then, how, there and elsewhere, to check the spread of the ordinary epidemics coming along those lines which complete sanitary measures will effectually close. I say effectually close, because I may adduce examples

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Malfea-
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where former centres of epidemics which have been effectually closed to them, and in which the children's epidemics for example are effectually banished.

Nonfeasance as to the spread of epidemics in schools.

The primary schools are the common centres of children's epidemics. We framed a set of rules for the regulation of the duties of the local officers of health. One of these duties was that the officer should regularly visit and inspect the children of the schools, and that when he detected premonitory symptoms on one of them, he should separate it, and go with it to its home, and there take order for its preventive treatment. The course in the home would be to separate the well from the ill; to take order that the child should be placed by itself in a room in a proper condition, and should have proper attendance and appliances, and that no one else should be admitted until after the disease had passed. It would follow that trained nurses should be appointed to visit the house, and see that the health officer's instructions are properly followed. We had provided regulations of the duties of the officer of health, which included weekly visits and examinations of children, at the infant and the primary schools. In going over the school with him the schoolmistress would point out to the inspector, or he would observe, the child with the premonitory symptoms to be looked to—the cold shivers, the pains in the head, and would separate it from the rest, and go home with it, examine the state of the habitation, and take order for the separation of the healthy children, and direct the sick ones to be kept alone, and give the requisite directions for its treatment; and a trained nurse would follow with more frequent visits to see that the directions were complied with. The regulations provided for similar visits and examinations of places of work; the separation of the workers, followed by visits to the habitation, and by the removal, as far as possible, of the injurious conditions found there. Had these regulations we had prepared been duly carried out, they would have carried preventives to a great proportion of the excess of fifty thousand fatal cases in the school stages, in addition to the adult stages of life, of the classes the most scourged, and would have stopped the widespread of the ordinary epidemics. But it must be borne in mind that these measures ought to be unnecessary if the amendment of the local conditions to which epidemics are due were completed, those measures would have reduced the demand for hospital accommodation to the minimum. Dr. B. Richardson has lately examined the subject on the difficult question at present of hospital accommodation to meet the small-pox epidemics in the Metropolis. He shows that

Reduction of the demand for large hospitals by home treatment and small hospitals for epidemics.

by provisions for home treatment in analogy with those provided for in our regulations, that the demand left after home treatment would be met by four small refuges or hospitals capable of holding from ten to fifteen cases each; that such arrangement would meet all the necessities of that epidemic for Marylebone, with its hundred and fifty thousand of population. But by our successor, who was not instructed in the local administrative organisation needed, our regulations were superseded. I consider this act as an administrative disaster, as a culpable misfeasance and nonfeasance, which has cost, and is costing, throughout the country many thousands of preventible deaths. In justification of this conclusion, I may state that by a select committee of the British Medical Association, appointed to consider the health laws, the same regulations have been reprinted, held forth and circulated, as models of sanitary regulations, of which they call for re-enactment. This view has been emphatically reinforced by all the medical Quarterlies. On re-examination it will be found difficult to deviate, without detriment, from the course of action which those regulations provide. Meanwhile, until justice is reclaimed for the administrative service in behalf of the public, as much as possible should be called for by appeal for voluntary effort. Of what this may do in preventing the spread of the ordinary foul air epidemics, I will state the experience of a nurse of twenty years' practice as a specialist in dealing with the most infectious and dangerous of them, namely, scarlet fever. Her chief practice was the common one in respect to all cases of the varied epidemics—to isolate the patient in a single room, the upper room if possible, and let no one else enter it; to so arrange as keep the door and part of the window open in order to let a current of air pass through the room over the patient; to observe all the details of regulations as to the cleanliness of the patient and the articles of clothing and furniture, and the removal of excreta, &c.; and as to her own personal protection, never to drink out of the same vessel that had been used by the patient, and to wash from head to foot twice a day with tepid water, and to change her clothes each day, serving in conditions of exhaustion with an empty stomach. With these precautions, she had never had a single case of the spread of the disease to a member of the family or anyone else during the twenty years; nor had she once contracted the disease herself! A collective example of the working of the principle provided for preventing the spread of epidemics is supplied by the Sanitary Aid Society near here, at Hastings and at St. Leo-

Reclamation by medical authorities of the re-enactment of the orders of the first general board of health.

Mode of staying the spread of ordinary epidemic by voluntary effort.

nards, under the direction of a very able and energetic lady, Mrs. Johnston. At Hastings, on the early information of the occurrence of infectious disease, the health officer attends, and she follows and visits from time to time more than he can do, to see that the requirements as to the isolation and treatment of the patient are duly attended to by the mother or the female resident in the house as it may be. The service is given which would have been rendered, under our regulations, by a trained nurse visiting the patients at their homes instead of at the ward of a hospital. I am assured that the arrangement has the full efficacy we anticipate from our rule. As one example, it is stated that since it has been at work not an instance has taken place there of the breaking up of schools from the outburst of an epidemic. On the nurse's practice of the protection of herself by head-to-foot washing, I may note that two medical officers who had been through the most dire epidemics in the East stated to the Academy of Medicine that they ascribed their immunity to their careful attending to that practice. Virchow showed at the Medical Congress that Pasteur's germs must have a predisposition or a nidus. It may be that the ablution destroys them. However that may be, I consider it an important topic that escaped our attention on the occurrence of the great epidemic we had to deal with. If it were to occur again, I certainly would proclaim and enforce the active application of water as a preventive. I had subsequent opportunities of observing its action as a factor of sanitation. I may state that I have received accounts of it, showing its efficacy, such as this. In one orphan institution, where the death-rate was twelve in the thousand, a cleansing of the place, the removal of cesspits and foul drains, the air cleansing was effected, the death-rate was reduced to eight in a thousand; and next a cleansing of the person was effected a constant ablution with tepid water, and then a reduction by another third, or to four in a thousand, was achieved. Other experiments tend to establish the value of personal cleanliness as a preventive factor at one-third.

It is to be borne in mind that our immediate object is the prevention of the spread of the foul-air-diseases occurring on the lines of the ordinary epidemics, whilst Sanitary Science has now evidence of primary prevention, of the possibility of their occurrence;—as in institutions, such as well-managed district schools on the half-time principle, where the children's diseases, as they are called, are, as of primary origin, banished; where a case of typhus has not been seen for years:

Frequent
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Epidemics
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as in well-administered prisons, the walls of which cannot shut out the epidemics of a climatorial character; but where, whilst they are freed from them, the surrounding populations are ravaged by them. In staying the spread of the ordinary epidemics by home treatment, or treatment in small refuges, we are saving the sufferers from the vastly increased dangers which statistics now demonstrate to be occasioned by collections of sufferers in the best appointed and the best managed huge hospitals. It may be objected that the intrusion of house-to-house treatment will not be accorded. As a matter of experience I can state that, in the house-to-house visitations, which we ordered under a penalty, during the visitation of the cholera, was everywhere well received, and that we did not hear of such refusals, or of any case for the infliction of a penalty. All, however, would depend upon the manner in which the law is executed, and the securities taken for the proper qualifications of the officers of health for the performance of the duties set forth in our regulations, the need of which has been reinforced on the part of the British Medical Association. The expense of the personal for the requisite improvement of local organisation may be objected to by those who have still to be informed of the wastefulness of ignorance and of unskilled service. The extension required would be the attribution of some three thousand local health officers, who would be under the control of the Local Government Board, forming part of the greater local administrative force, including that for the relief of destitution, with which that Board is now charged. Objections were made locally to the appointment of some seventeen thousand paid local officers, including medical officers, on the principles of administrative organisation set forth in my report, of 1833, on the administration of relief to the destitute. But by that expenditure the administration was, with all shortcomings, vastly improved, and an economy effected of more than one-half over the unpaid services of the overseers and of the parish officers;—that half amounting to upwards of four millions. Since then, by error in superior administration, it has been sent back, and the economies of the local taxation have been reduced. But here again I have the consolation of the vindication of principle by the recent reclamations of the representatives of the new local sanitary authorities (the Boards of Guardians), who have sent petitions to both Houses of Parliament, praying for a return to a more efficient administration of those same principles of 1833. Petitions of the same tenor have been sent to Parliament from the Chambers of Agriculture with a view to the

good sanitary conditions.

Good local appointments of paid sanitary officers a means of economy.

Petitions for the advanced

application
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down in
1839 for
economy
and effi-
ciency.

relief of the pressure of local taxation in the rural districts. With the warranty of part success in the economy of local rates by improved administration, I can undertake that, if I were in a position to examine the administrative officers myself, I could demonstrate the practicability of a relief to the amount of some three millions per annum of the local taxation, in compliance with the prayers of the petitioners, and, in that economy, there would be included improvement of the local sanitary service which the British Medical Association have sought for in an improvement of the status of the executive sanitary local officers. In fact, the foregoing propositions may be now presented in the following light, viz.: that the object of sanitary administration is not merely to reduce suffering or alleviate misery, but to save money; and that our immediate object of preventing the spread of epidemic diseases is to prevent the spread of charges for curative relief or for funerals, and to prevent the cost of extended working disability, which must be borne on the rates or by somebody. It is a defect of our fiscal system that it gives only an account of expenditure, and is heedless of the results; and, in other words, gives no account of them in savings. In a recent report by the Local Government Board it is shown that sanitary administration in England and Wales during the last decade has, by scattered local exertions, somewhat emerged from the dead level, in which an inefficient reactionary administration had kept it, and that during the last decade there has been some movement and a reduction of the death-rate by nearly four and a half per cent., chiefly from the diseases prevented by sanitary work, and that this amounts to a saving of a quarter of a million of lives, and at least of three million cases of sickness (with proportionate amount of cash). For, I have shown that this means, that, in the saving of the expenses of a quarter of a million of funerals, and of the cures of three millions of cases of sickness, the result at the very least is an economy of four millions of money, during the decade, in England and Wales. This saving of money by sanitation is, however, estimated on a reduction of the general death-rate by only $4\frac{1}{2}$ per cent., whilst we have before us, in various parts of the country, examples of the reductions of death-rates by 25 and 30 per cent., through rudimentary, very rudimentary, sanitation. But the economical operation is brought more closely in view in the case of the army. Whilst the losses by the sword had been as one, the previous losses by disease had been as heretofore as more than three. On the return of the army from the Crimea, the service whose

Pecuniary
gains by
efficient
sanitation
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concern was with the smaller loss was honoured and conserved for further care and improvement; whilst the preventive service, conserved in the larger conservation of force, was allowed to pass away unnoticed and unrewarded. But it did appear to me that the service rendered by the Army Sanitary Commission, composed of sanitary officers trained under our first General Board of Health, who, it was declared by the War Minister, had saved the second army in the Crimea, had been allowed to pass away, unapplied and unappreciated—when it did appear to me that the experience gained in the Crimea might have been applied to the saving of our army in India, and, in 1858, I wrote an expository paper to that purpose. At the instance mainly of the Secretary of State for India and Miss Florence Nightingale a Commission of the War Department (of which the surviving members are now Dr. J. Sutherland and Captain Galton, after it had completed the great improvement of barracks and hospitals at home, and which have reduced the home army death-rates by one half) was got to work as a Commission for the Protection and the Sanitary Improvement of the Army in India and other places. The service of that Commission for twenty years has been rendered mainly by two of the sanitary commissioners trained by us, whose labours had saved that army in the Crimea; namely, Dr. Sutherland and Mr. Robert Rawlinson, and subsequently also by Captain Galton. By the last returns it appears that the death-rate in the Indian army, which was formerly 69 in a thousand, was during the last decade less than 20 per 1,000; and that during that decade there has been a saving of life of 28,000 men, and a saving of force from sickness of about the same number, and a total saving of nearly double the British army at Waterloo. But no account is taken of the saving in money. It is an underestimate at 100*l.* per man, which makes the money-saving during the decade 5,321,700*l.* for that period, an economy which may be commended to the attention of the Premier as Chancellor of the Exchequer, and to Parliament, with the assurance that with a due attention to past sanitary service, and to the improvement of its organisation, and effective position for the future—a yet greater economy may be effected. In further assurance of this, we may recall the partial economies of sanitation accruing,—the economies first achieved, as I have recited, by our defences against the extraordinary epidemic with which we had to contend, when the savings of the expenses of funerals, from premature deaths throughout Great Britain, must have been about as much as if the whole of the present population of the City of London, 50,000, were killed,

Examples
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and had to be interred separately. We may add to this the pecuniary economy of the saving of force by the saving of the health and lives of the second army in the Crimea, acknowledged to have been achieved mainly by the specialists trained under our Board. Altogether we may, I submit, claim credit for the collective economies of the past for the sake of the future—now especially—in claiming as a source of economy, if properly conducted, the relief of the population from the pecuniary burdens, direct and indirect, now inflicted upon them by the continued retention of removable conditions of the ordinary as well as of the extraordinary epidemics.

Acknowledgment of the past service, for the sake of the future protection of the population.

Experience has shown that all the principles of sanitation elaborated, and all the measures prepared on them for the relief of the Metropolis, will have yet to be applied for the reduction of the existing burdens, chiefly from the ordinary epidemics and diseases of the zymotic class, amounting to some twenty thousand of lives, and a burden of from one to two millions of money there annually. An aphorism of Burke has been held out to me as a warning, 'that those who would carry out great public principles must be proof against the most fatiguing delays, the most mortifying disappointments, the most shocking insults, and what is worse than all, the presumptuous judgments of the ignorant upon their designs.' Much of this will be found to have been exemplified in the early progress of sanitation in this country. Competent and impartial judgments admit and declare that the ignorance and apathy to the prevention of pain and misery to others, and the want of official energy to withstand the sinister interests that occasioned the discontinuance of the first General Board of Health, and the obstruction of its measures, have thrown back sanitary progress by a quarter of a century; and that the just recognition of past public services, not to say atonement for their frustration, as well as an assured relative position of the service itself—is due and requisite for the attainment of further advances.

I now beg to recapitulate the chief conclusions which the facts in question appear to establish.

General conclusions for the prevention of the occurrence and spread of epidemics.

That cases of small-pox, of typhus, and of others of the ordinary epidemics, occur in the greatest proportion, on common conditions of foul air, from stagnant putrefaction, from bad house drainage, from sewers of deposit, from excrement-sodden sites, from filthy street surfaces, from impure water, and from overcrowding in foul houses.

That the entire removal of such conditions by complete sanitation and by improved dwellings is the effectual preventive

of diseases of those species, and of ordinary as well as of extraordinary epidemic visitations.

That where such diseases continue to occur their spread is best prevented by the separation of the unaffected from the affected, by home treatment if possible; if not, by providing small temporary accommodation; in either case obviating the necessity of removing the sick to a distance, and the danger of aggregating epidemic cases in large hospitals—a proceeding liable to augment the death-rates during epidemics.

That skilful and complete works of sanitation and the removal of conditions of stagnancy and putrefactive decomposition are the most efficient means of reducing the expenses of excessive sickness and death-rates.

For my own time there is little left to me, but the valedictory vindications of established and experienced principles; and, for the sake of their advanced application. I would conclude in the terms of a passage which I quoted in my report of 1842 from a distinguished communicant and supporter at that date—Dr. Wilson, of Kelso. After having noted some improvements which had taken place, as it were, accidentally, and independently of any particular aids of science directed to their furtherance, he observed: ‘It is impossible to avoid the conclusion that much more still might be accomplished could we be induced to profit by a gradually extending knowledge, so as to found upon it a more wisely directed practice. When man shall be brought to acknowledge (as truth must finally constrain him to acknowledge) that it is by his own hand, through the neglect of a few obvious rules, that the seeds of disease are most lavishly sown within his frame, and diffused over communities; when he shall have required of medical science to occupy itself rather with the prevention of maladies than with their cure; when Governments shall be induced to consider the preservation of a nation’s health as important as the promotion of its commerce or the maintenance of its conquests—we may hope then to see the approach of those times when, after a life spent almost without sickness, we shall close the term of an unharassed existence by a peaceful euthanasia.’





